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ABSTRACT

After organizations decide upon innovations these innovations must be implemented. The likelihood and the ease of getting an adoption unit (the segment of the organization responsible for translating decisions into action) to implement an innovation desired by a decision unit depend upon a number of factors: (1) the adoption unit's perception of the risk involved, (2) the complexity of the innovation, and (3) the power and communication costs required to overcome the adoption unit's resistance. The decision unit has three types of power available to it--sanction, authority, and influence--and each of these types has associated costs and demands a different level of involvement. The interaction of these various factors can be charted and the costs of various combinations assessed. Organizations must be alert to situations that might overload their communication channels and thereby prevent successful innovation implementation. (JL)

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CHARACTERISTICS OF INNOVATIONS AND ORGANIZATIONAL STRUCTURE RELATED TO INNOVATION IMPLEMENTATION

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Characteristics of Innovations and Organizational Structure Related to Innovation Implementation

Modern organizations must constantly adapt to survive in today's rapidly changing environment. As a result the implementation of innovations is crucial to organizational success. This process is important both for organizational effectiveness (Rogers & Agarwala-Rogers, 1976) and for the redirection and integration of the organization as a system (Wager, 1962). Communication plays a central role in the implementing of any innovation. The nature of information transmitted concerning an innovation can be grouped into three general categories: (1) information concerning the innovation; (2) influence and power information related to innovation; and (3) information concerning the operationalizing of the innovation (Schramm & Roberts, 1971). What follows is an attempt to specify the manner in which characteristics of the innovation transmitted in communication messages and structural aspects of organizations related to communication determine the ultimate implementation of innovations in organizations.

Innovations can take several forms: (1) innovation in a product or service; (2) in a production process; (3) in organizational structure; (4) in people; and (5) in policy (Zaltman, Duncan, & Holbek, 1973). Whatever its form, a unique feature of innovation in an organizational setting is that a unit of higher status and authority can decide to adopt an innovation which another segment of the organization must implement. The former unit has been termed the decision unit and the latter has been termed the adoption unit, and the process as a whole has been described as an authority-innovation decision (Rogers & Shoemaker, 1971). Successful

implementation of an innovation can be conceived of as the routinization, incorporation, and stabilization of the innovation into ongoing work activity. For organizations: "The bottom line is implementation (including its institutionalization), and not just the adoption decision" (Rogers & Adhikayra, 1979, p. 79).

The implementation of an innovation can be viewed as an uncertainty reduction process. Advocating change necessarily results in increased uncertainty, which can lead to resistance to innovation by adoption units (e.g., Coch & French, 1948; Katz & Kahn, 1966). Communication plays a key role in overcoming resistance to innovations and in the reduction of uncertainty. Indeed some communication researchers see the principal function of communication in organizations to be the reduction of uncertainty (e.g., Farace, Taylor, & Stewart, 1978).

Uncertainty is generally conceived of as a function of: the number of alternatives and the probability of the occurrence of each alternative (Farace, Monge, & Russell, 1977). Complexity and risk are elements of uncertainty which are crucial to the ultimate implementation of innovations. Complexity relates to the number of potential alternatives perceived in an innovation. Risk is the perceived consequences to the adoption unit associated with the implementation of an innovation (Lowrance, 1980).

Both of these factors relate directly to the capacity of communication messages to reduce uncertainty in the adoption unit, and hence they relate to the capacity of the decision unit to send effective communication messages; messages which bring the receiver into greater compliance with

the source (Farace et al., 1978). In most instances for successful implementation to occur the message transmitted by the decision unit must evoke a similar meaning when received by the adoption unit (Rogers & Shoemaker, 1971). One factor which can increase the difficulties inherent in innovation implementation is a lack of homophily between the two units attributable to differentiation of function. This factor can increase the probabilities of distortion in communication messages associated with innovation implementation (Tushman, 1978).

While the reduction of uncertainty can decrease resistance to innovations, usually decision units also exert some degree of power and influence to facilitate innovation implementation. In fact, the various types of power and the communication channels available to send messages related to innovations are the primary structural characteristics of organizations which affect the ultimate implementation of an innovation. The commonly used types of power in organizational settings have different communication costs associated with them. In fact some combinations of power, complexity, and risk can overload available communication channels, creating an upper limit to the capacity of an organization to successfully implement certain innovations. The succeeding pages will more fully develop the argument that an organization's success in overcoming complexity and risk associated with innovations will in large part be determined by the amount of resources it devotes to these structural characteristics related to communication.

Risk

For the adoption unit the key element in their response to an innovation is the perceived consequences in engaging in the new behavior

advocated in the communication message from the decision unit, since implementation of an innovation implies action and attendant consequences (Kivlin & Fliegel, 1967). The presence of risk in an innovation can lead to greater resistance than is present in normal organization operations because the very novelty of the innovation entails more risk for the adoption unit and for the organization as a whole (Rogers & Adhikayra, 1979). In fact, the greater the uncertainty of outcome regarding an innovation the greater the degree of perceived risk toward implementing the innovation.

Since innovations involve new situations such that the chances of loss are formally unpredictable (Strassman, 1959), advocated changes offer a potential threat to organizational members which will increase with increases in the degree of advocated change (Huse, 1975; Zaltman & Duncan, 1977). The more successful a decision unit is in decreasing the adoption unit's perception of risk, the less their resistance to innovation implementation.

P1: The more risk perceived in an advocated innovation, the less the likelihood of successful innovation implementation.

Complexity

Complexity refers to the number of dimensions along which an innovation can be evaluated by a potential receiver; thus it is an inherent characteristic of messages concerning an innovation. As Bohlen (1971, p. 807) has noted: "other factors equated, the more complex an idea is,

the more slowly it tends to be adopted." The greater the complexity related to using an innovation or in merely understanding the innovation cognitively, the greater is the resistance to an innovation (Zaltman & Duncan, 1977). Accordingly:

P2: Generally, the greater the complexity of an innovation advocated by a decision unit, the less the likelihood of successful innovation implementation.

The complexity of an innovation is related to its uncertainty, since with greater complexity more dimensions (or alternatives) must be considered. Thus there is an increased number of factors to evaluate and with more dimensions to consider, fewer can be known with any certainty. Thus complexity increases the perceived risks associated with an advocated innovation and these two factors together can interact to increase resistance to an innovation.

Power and Communication Costs

Since the focus here is on the implementation of an innovation that has previously been adopted by another organizational unit, the various types of power used to overcome resistance on the part of the adoption unit become crucial in determining innovation implementation. Even when individuals in the adoption unit conform to executive decisions attitudinally, the implementation of an innovation behaviorally can be hindered through both passive and active resistance (Zaltman et al., 1973). The types of power used by the decision unit to induce the adoption unit to implement an innovation have important consequences for the costs of communication incurred in innovation implementation. These types of power also induce differing levels of involvement with the innovation,

a factor which is usually crucial to the successful adoption of any innovation (Bennis, 1965).

Communication Costs

Generally, three main types of power, or the capacity or potential to determine the actions of the adoption unit, can be used by the decision unit: sanction, authority, and influence. Sanction refers to the ability to control the adoption unit's action through the active manipulation of resources under the decision unit's control.

Reward and coercion are two separate manifestations of this type of power (French & Raven, 1959). Both rest on the belief of the adoption unit that the decision unit controls material and psychological resources that are important to it. While both of these types of power can be effective, their use incurs considerable costs to the decision unit. First, they require the continuous expenditure of resources, some of which may result in satiation and thus lose their impact. Second, both require constant monitoring of the adoption unit to ensure that it is acting in a manner that is consonant with either continued reward or punishment. Thus there are heavy communication costs (See Figure 1) to the decision unit both in terms of determining what may reward or punish the adoption unit at any particular time, and also in reviewing the adoption unit's activities.

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FIGURE 1 about here

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Authority, or legitimate power in French and Raven's (1959) taxonomy, rests on the belief of the adopting unit (resulting from an internalized norm or value) that the decision unit has the right to dictate innovations.

The use of this type of power has several advantages over the use of sanctions; (1) it does not require constant monitoring; (2) legitimate power derives from previous rewards and punishments associated with socialization and thus does not require specific sanctions for every innovation; (3) satiation is less of a problem; and (4) communication costs are primarily associated with transmission of information concerning the innovation through formal channels.

P3: Legitimate power results in less communication cost to the decision unit than the use of sanctions in securing eventual innovation implementation.

Influence rests on the capacity of the decision unit to cause changes in the adopting unit's behavior by the use of more subtle or indirect means than those of sanction or authority. There are three primary types of influence: referent, expert, and persuasion.

Referent power is based on the adoption unit's identification with the decision unit (French & Raven, 1959). Indeed the greater the prestige of the decision unit, the more likely it is to influence the adoption of an innovation (Huse, 1975). In the case of referent power the adopting unit institutes an innovation merely because the decision unit has; the decision unit may not even be aware of its influence. The communication costs associated with this type of power are almost exclusively associated with the transmission of information concerning the nature of innovation and are primarily borne by the adoption unit.

More central to the problem addressed here is the use of influence based on expert power, or the adoption unit's perception that the decision

unit has greater knowledge in the salient area of the innovation, and thus its judgement of the innovation's utility should be accepted. The communication costs associated with the use of this type of power will vary with the complexity of the innovation. In the case of a simple innovation, the costs may be very low, approaching the level of the use of legitimate power. However, for complex innovations the use of this type of power can result in high communication costs associated with the mere transmission of information concerning implementation of the innovation.

In utilizing persuasion, the decision unit communicates evidence, arguments, and a rationale advocating implementation of the innovation by the adopting unit. In essence it attempts to convince the adopting unit that it should voluntarily change its behavior. The communication costs associated with the use of this type of power are high initially, and, at least in the case of counter persuasion attempts, they may be continuous.

P4: Communication costs related to the use of influence in securing eventual innovation implementation will generally be highest for persuasion, followed by expert power, with referent power requiring the lowest communication costs to the decision unit.

Level of Involvement Induced

While each of the forgoing types of power can result in changes in behavior, and in some instances they may be used simultaneously to even greater effect, they each induce differential levels of involvement in the adopting unit. High levels of involvement usually play a crucial role in the ultimate implementation of innovations. Figure 1 graphically reveals the relationship between the five types of power discussed in the

previous section and their position on the dimensions of communication costs and involvement.

Use of sanction power results in a relatively low level of involvement, because reactions to it are usually based on a calculation of benefits and costs, resulting in motivations to change one's behavior due to extrinsic influences. The use of legitimate power usually dampens the creativity of workers and impairs their willingness to suggest modifications since they are not active participants in the decision making process. Typically when legitimate power is used the adoption unit will engage in routine, mechanical operationalizing of an innovation which is identified with the decision unit. However, successful innovation implementation requires some modification in actual practice based on the experience of users (Rogers & Adhikayra, 1979).

Influence power results in more active involvement on the part of the adoption unit, since these methods usually entail an attitude change which is positive to the required behavioral change (Kelman, 1969). In both expert and referent power there is voluntary acceptance of the innovation resulting from perceived characteristics of the adoption unit. Since persuasion results in greater participation in the implementation of innovation, it usually results in less resistance to technological change (Kelman, 1969). Because of the voluntary, spontaneous acceptance associated with the use of persuasion, this type of power is usually the most successful in ensuring the active involvement necessary for successful implementation of an innovation (Bennis, 1965).

P5: As a result of the active involvement it induces, generally the use of influence will be more

effective in innovation implementation than either sanction or legitimate power.

Effects of Risk and Complexity

The complexity and perceived risks inherent in innovations interact with the types of power to determine the communication costs associated with the implementation of particular innovations. Indeed the perception of risk is often a result of a lack of knowledge concerning the implications of an innovation (Strassman, 1959) which necessitates additional information transfer for effective innovation implementation. The more risky the adoption of an innovation, the more likely it is that the adoption unit will be resistant, either requiring more rewards or influence attempts before acquiescing in the implementation of an innovation (Zaltman & Duncan, 1977).

P6: Generally the greater the perceived risk, the greater the exercise of power needed to implement an innovation.

Complexity also affects the types of power which will be used to promote innovation implementation. For example, the more facets to an innovation, the more actions which have to be rewarded, and somewhat relatedly, the greater the volume of information related to persuasion. While those modes of power which have high communication costs, persuasion, sanction and also in this case expert power, increase almost exponentially with greater complexity; other types of power, legitimate and referent, increase more linearly since the invocation of these types of power is inherent in the messages concerning the innovation.

P7: In effectively implementing an innovation, there is a linear increase in the communication costs

of legitimate or referent power with increasing complexity.

P8: In effectively implementing an innovation, there is a multiplicative increase in communication costs associated with persuasion or sanction power with increasing complexity.

These hypotheses suggest that the effectiveness of various types of power in overcoming resistance due to uncertainties resulting from increasing risk and complexity is limited. For example, the use of expert power is usually insufficient by itself when a high degree of uncertainty exists (Zaltman & Duncan, 1977). Even though it performs an educative function in explaining the innovation at a cognitive level the threat of risk may not be mediated. With an increase in risk and complexity, the decision unit is limited in its use of legitimate power as well; since it would probably need to exercise authority beyond accepted parameters. When authority is used to excess there is a constant danger that the decision unit's authority over the adoption unit may actually decrease (French & Raven, 1959).

Generally, persuasive strategies have been found to be the most effective means of ensuring the successful implementation of a highly risky and complex innovation (Bennis, 1965; Zaltman & Duncan, 1977). Persuasion can best overcome resistance attributable to both lack of understanding and to fear; in addition, its use induces a higher level of involvement (Bennis, 1965). However, while persuasion is the most effective strategy, it is also the most costly. So costly, in fact,

that there may be increasingly diminishing utility to the organization in the implementation of highly risky and complex innovations.

Communication Channel Efficacy

One of the primary structural features associated with the diffusion of innovations within any system is the number and arrangement of recurring communication channels. These channels have differing capacities for handling particular types of information and their combined capacities limit the raw volume of information in any system. Communication channel efficacy refers to the ratio of resources expended to the utility of a transmission event (Farace et al., 1978). The efficacy of a channel is important since it determines the ultimate cost effectiveness of the process of innovation implementation. Traditionally the diffusion literature has grossly categorized communication channels into two categories: interpersonal, involving primarily face to face channels, and mass media channels, which are typically interposed in some way between the source and the receiver (Rogers & Shoemaker, 1971).

The influence of others through interpersonal channels is important in overcoming perceptions of risk. When an adoption unit perceives an innovation to be risky, often the capacity of interpersonal channels to provide social support and enhanced confidence in the outcomes of the innovation can be crucial in innovation implementation (Katz, 1957; 1961). Typically interpersonal channels are more likely to meet the specific needs and questions of the adoption unit as a result of their immediacy of feedback and the situation specificity of their communication (Schramm, 1973).

P9: With increases in perceived risk, interpersonal channels will become increasingly more effective in innovation implementation.

While mass media channels tend to provide background information of a fairly general nature, it is often not specific enough to overcome perceptions of risk (Cartwright, 1949; Rogers, 1976). However, when risk is not a major factor, the use of mass media channels becomes more efficacious, especially when considering their speed to larger audiences and their multiplicative power (Schramm, 1973).

P10: With decreases in perceived risk, mass media channels will become more efficacious in innovation implementation.

The more complex the innovation, the greater the resulting work related uncertainty and hence the greater the communication costs associated with its implementation (Katz & Tushman, 1979). Interpersonal channels have generally been found to be more useful in transmitting highly complex subject matter (Chapanis, 1971; Conrath, Buckingham, Dunn, & Swanson, 1975; Tushman, 1978). Since these channels are generally more flexible than mass media channels, they can activate more senses and be more attuned to the specific problems of receivers (Rogers & Shoemaker, 1971; Tushman, 1978). Interpersonal Channels are also able to carry more information through a variety of codes; as a result of this 'richness' of channel, they are able to better reduce the uncertainty caused by complexity (Holland, Stead, & Leibrock, 1976).

P11: With increasing complexity, interpersonal channels will become more effective in innovation implementation.

However, the communication costs associated with the use of interpersonal channels are generally quite high. In situations of low complexity a minimum of activity is necessary to relate dimensions to the experience world of the individual. Thus mass media channels can widely distribute the essential information concerning the innovation with a minimum of effort (Rogers & Shoemaker, 1971).

P12: With decreasing complexity, mass media channels will become more efficacious in innovation implementation.

In the organizational literature communication channels typically have been discussed in terms of their formality, with interpersonal channels typically termed informal and mass media (primarily written) channels associated with the formal authority structure of the organization (Dahle; 1954; Tompkins, 1967). Since legitimate and sanction power are typically tied to this formal authority structure, messages concerning them typically flow along mass media channels. On the other hand, messages from the decision to the adoption unit related to innovation implementation involving influence typically flow along more informal channels. For innovations for which a minimum degree of resistance is expected, typically mass media channels will be used. However, when risk and complexity act to increase resistance to innovations, the more informal channels become more effective in implementing innovations.

Particularly important in the implementation of risky and complex innovations are subformal channels. These channels are primarily interpersonal and reflect the informal authority structure of an organization (Downs, 1967). Indeed interpersonal influence processes are often viewed as playing a determinant role in the implementation of innovations (Rice & Rogers, 1981; Holland et al., 1976) and subformal channels are the primary conduits of this type of influence.

P13: With increasing risk and complexity, the greater the access of the decision unit to the adoption unit via subformal channels, the greater the likelihood of successful innovation implementation.

Communication Load

While the propositions developed here suggest specific strategies which could be utilized in successful innovation implementation, the introduction of the notion of channel efficacy also suggests some potential problems. The general techniques involved in successful innovation implementation have been known in broad detail for a long period of time, but units within organizations have still proved remarkably resistant to innovation. An examination of the interaction between the various factors which contribute to successful implementation can provide an explanation for this state of affairs.

Figure 2 details the interactive effect of risk, complexity, and the communication costs of power on communication channel load. For simplicity, these factors, which can be presumed to vary in intensity, are divided into two conditions, either high or low. A cursory examination of the resulting eight conditions reveals some substantial barriers to innovation implementation in specific situations. When all of the factors are high, the volume of communication needed to overcome resistance may be too great; potentially overloading available channels (both interpersonal and mass media) or making the costs of implementing the innovation greater than its potential benefits. The remaining seven conditions have more moderate, although still high in some instances, loads. The lowest level, where risk, complexity, and the communication costs of influence are all low, represents the optimal situation for using mass media channels.

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FIGURE 2 about here

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Interestingly there appears to be a direct inverse relationship between the amount of information load associated with particular conditions and the presumptions of the relative success of implementation. Certainly with a highly risky and complex innovation that requires high volumes of communication to effect, the chances of successful implementation become problematical.

An organization could, in an ideal world, choose to expend the effort to implement an innovation in these conditions, but, especially for the all high condition, there may not be the channel capacity to affect it, especially if the normal operational level of organizational information load is maintained. Thus these contingent situations suggest that there is a practical upper bound to implementing innovations in organizations.

Discussion

While the focus here has been on the role of the decision unit in inducing an adoption unit to implement innovations, the actions of the decision unit after receipt of information concerning the innovation can also have important impacts on the process. For example, resistance to an innovation can result in substantial modification in its implementation, in those cases where the innovation is not rejected outright.

Another factor which can affect innovation implementation is information seeking on the part of the adoption unit triggered by the implementation message. This information seeking can further increase the load on existing organizational communication channels. In general, uncertainty concerning the nature of the innovation results in a quest for additional information concerning the innovation particularly from

interpersonal channels (Holland et al., 1976).

Indeed failure to communicate sufficient information regarding potential risks can delay implementation, since the adoption unit will usually attempt to gather additional information to reduce uncertainty before it acts behaviorally. However, this information seeking is limited by access to certain channels (Holland et al., 1976), which the organization may be able to control. At times this information seeking can stimulate countervailing pressures from other sources within the organization concerning the innovation. Generally when there is countervailing pressure, the likelihood of successful implementation is substantially reduced (Katz, 1957).

In today's rapidly changing environment, organizations must constantly adapt, becoming increasingly more productive, if they are to survive. A number of hypotheses have been stated here which suggest specific strategies organizations might engage in to increase the probabilities of successful implementation. However, the interaction of risk, complexity, and power places upper bounds on an organization's effectiveness in implementing innovations. If all of these factors are high, then an organization may not possess the structural factors, necessary to overcome resistance in the adoption unit. Thus there appears to be a direct inverse relationship between communication load and the probabilities of successful implementation of innovations.

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FIGURE 1

Communication Costs and Levels of Involvement Associated with Various Types of Power

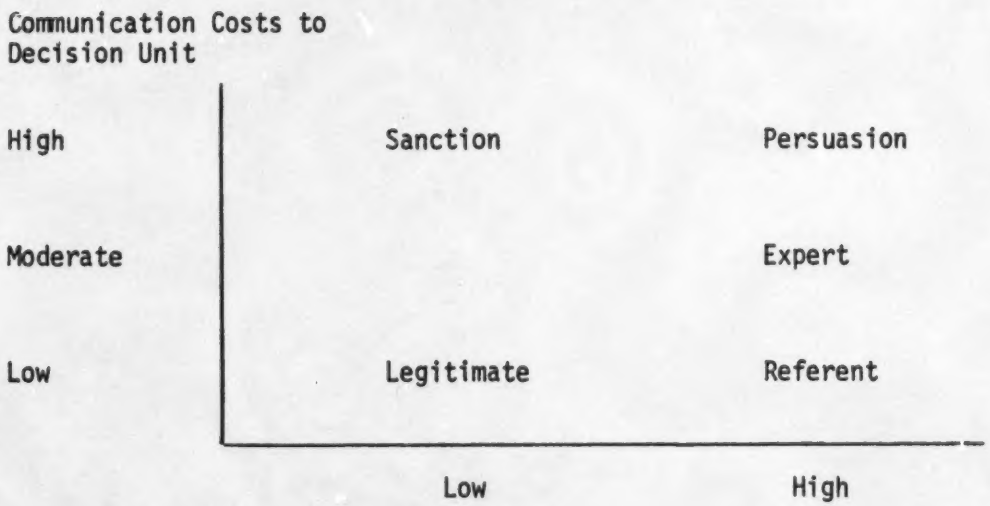

FIGURE 2

Relationship Between Risk, Complexity, and Communication Costs of Power and Channel Load